Math 1312 **Practice Exam 2**

There will be 5 or 6 problems on the test. All of them will be similar to the problems shown here.

1) Find the area of the region bounded by the curves $y=x^2-4x+4, y=x^3,$ and $x=0.$ $\left(A=\frac{25}{12}\right).$

2) Find the area of the region bounded by the curves $x=y^2+1$ and $x=y+3$. $\left(A=\frac{9}{2}\right).$

3) Find the volume of the solid created by revolving the region bounded by the graph of $y=x\sqrt{2-x}$ and the x -axis about

   a) The x -axis. $\left(V=\frac{4\pi}{3}\right)$

   b) The y -axis. $\left(V=\frac{256\pi\sqrt{2}}{105}\cong 10.83\right)$

4) A gasoline tank in the shape of an upright cylinder is buried so that the top of the cylinder is 4 feet underground. The tank is 8 feet tall and has a radius of 5 feet. How much work is required to pump all of the gasoline out of the tank if the tank is half full? The density of gasoline is 46 pounds per cubic foot. $(46000\pi\ foot\ pounds)$

5) A force of 40 pounds is required to compress a spring 8 inches. Find the work required to compress the spring 12 inches. $(360\ foot\ pounds)$

6) Find the length of the arc of the graph of $f(x)=\frac{4}{5}x^{5/4}$ on the interval $[0,4]$. $\left(\frac{16\sqrt{3}}{5}+\frac{8}{15}\cong 6.08\right)$

7) The region bounded by the graphs of $y=2\sqrt{x}, y=0,$ and $x=3$ is revolved about the x -axis. Find the **surface area** of the solid generated.

$\left(A=\frac{56\pi}{3}\right)$

8) Find the centroid (that is, find $\acute{x}$ and $\acute{y}$) of the region bounded by the graphs of $y=x^2$ and $y=2x+3.$ (Centroid is at the point $\left(1,\frac{17}{5}\right)$)

9) Find the center of mass (that is, find $(\acute{x},\acute{y})$) for the lamina of uniform density ρ bounded by the graphs of $y=\frac{1}{2}x^2, y=0, x=2$. The formulas for center of mass are

$$\acute{x}=\frac{M_y}{m}, \acute{y}=\frac{M_x}{m}, \text{where } M_x=\rho\int_a^b\left[\frac{f(x)+g(x)}{2}\right][f(x)-g(x)]dx$$

$$M_y=\rho\int_a^b x[f(x)-g(x)]dx, \text{and } m=\rho A$$

10)

A cylindrical tank is 10 feet high with a diameter of 4 feet. The tank is buried upright so that the top of the tank is 2 feet underground. The tank is half full of oil with a weight density of 100 pounds per cubic foot. How much work is required to pump all of the oil from the tank to the ground level?